Remelted Steels

Air-melted / VIM
VAR
ESR / PESR

Forged Products

Open-die
Closed-die
3d-forgings
Rings

High Value Metals

Powder Metallurgy
Titanium
Etc.

SMR Premium provides the information and expertise to turn your plans into reality.

Your business - our service - real advantage.
1. Short Overview / Introduction

2. Focus Special Steel Industry

3. Focus Powder Metallurgy Industry

4. Short Outlook?
Overview of the Global Steel Industry

Forgings, castings account for a tiny share of the total steel industry. Powder industry as well a niche.

Total Steel Products
~1,809 million tonnes (crude)

Total Powder Metallurgy
~ 1.3 million tonnes

Closed Die Forgings
~ 18.5 million tonnes
1.1%

Steel Castings
~ 10.9 million tonnes
0.6%

Open Die Forgings
~ 5.2 million tonnes
0.3%

Rings
~ 1.8 million tonnes
<0.1%

<0.1%
Overview of the Global Steel Industry by Steel Type*

**Growth Rates 2018 vs. 2017 – the year was quite promising but what about 2019?**

- **CARBON STEEL PRODUCTION**
  - 1.400 Mt / 89.0 %
  - $: Market Share 80 %

- **Total Alloy Steel Production**
  - 174 Mt / 11.0 %
  - $: ~20% of Market

- **Ni - Alloys**
  - 332 kt
  - +9%

- **Alloy Tool Steel & HSS**
  - 2.02 Mt
  - +4%

- **Stainless Steel**
  - 45.2 Mt
  - +6%

- **Other Alloy Steels**
  - 126.1 Mt
  - +5%

- **Titanium**
  - 184 kt
  - +5%

* finished product basis
Focus on Powder Metallurgy Market

Focus on value before volume and target the high end of the powder market.

Global Market [volume]

- Press & Sinter 94%
- Specialty Metal Powder Market 6%
- Specialty Powder Market
  - Powders for AM
  - Powders for MIM
  - HIP Steels / Products
  - Thermal Coating
  - Special Press & Sinter

Increasing Value
- Increasing Volume
The Outlook is a mixed bag for SPECIAL STEELS.

Selected Industrial Sectors by Phase of Cycle

- Oil & Gas Exploration
- Power Gen
- Gas & Steam Turbines
- Power Gen Others
- Process Industries
- Aerospace Industry
- Transport Industry

Relevant Industry Segments on the Business Cycle
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Remelted Special Steel – Applications

A wide variety of applications but future competition from metal powder applications?

POWER-GEN
- Blades for Gas & hypercritical Steam Turbines
- Discs / Rings
- Bolts
- Shafts
- Nuclear
- FGD

AEROSPACE
- Discs / Rings & Blades
- Studs
- Bolts
- Rivets
- Structural Parts
- Landing Gears
- Bearings

TOOLS
- Extrusion Tools
- Die Casting Moulds
- Precision
- Plastic Moulds
- Rolls
- Coining Tools
- Forging Tools
- Hot Pressing
- Tube mandrels

OIL & GAS
- Completion tools
- Non magnetic components
- Safety valves
- Tube & Pipe
- Pipe joints
- Fittings / Flanges / Seals

TRANSPORT
- Manifold Studs
- Injection Parts
- Bearings
- Special Valves
- Piston Rings
- Turbochargers

MEDICAL
- Trauma Fixation
- Stents
- Dental Wire
- Pacemaker Wire
Remelted Special Steel

Still a specialty niche market beside Ti. Remelted tonnage largest ATS + HSS, followed by NA, AS & STS.

...will increase due to more demanding operating conditions!
Targeting ingot casting route (higher yield loss/costs) for special steels with large CC/Segment casters:
(in vertical or horizontal arrangement in dimensions 350 to 1,500mm)

- **Target Products (round but also square/rectangular)**
  - Feedstock for Seamless Tube Rounds & Mandrel Bars
  - Feedstock for Tool Steel Bars/Blocks
  - Feedstock for Closed/Open-die forgers and RFM Players
  - Feedstock for Ring Rollers
  - Feedstock for Roll Manufacturer (mainly working/Intermediate rolls)
  - Feedstock for Remelting Operators (mainly ESR)
  - Feedstock for SBQ Products

- **Grades**
  - High quality Carbon Steel
  - Alloy Steel (incl. bearing steels)
  - Alloy Tool Steel
  - Stainless Steel

- **Industries**
  - Automotive
  - Other Transport (trucks, ship, rail, aerospace)
  - Oil & Gas Industry
  - CPI (Chemical Process Industry)
  - Power Generation
  - Mechanical Engineering
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Focus on Powder Metallurgy Market

Overview of leading PM Production Technologies for Steel Products (HIP, MIM, AM).

Selected Steel Powder Products Production by Process

Coating  HIP  MIM  AM  P&S

[Index Basis 2005 = 100]


Carbon Steel 1%
Alloy Steel 5%
Tool Steel & HSS 62%
Stainless Steel 22%
Others 2%
Super Alloys 8%

MIM by Grade

Tool Steel & HSS 3%
Stainless Steel 53%
Super Alloys 11%
Others 11%
Carbon Steel 2%

HIP by Grade

Tool Steel & HSS 62%
Stainless Steel 22%
Carbon Steel 1%
Alloy Steel 5%
Others 2%
Super Alloys 8%

AM by Grade

Stainless Steel 32%
Super Alloys 37%
Others 17%
Tool Steel & HSS 10%
Alloy Steel Carbon 4% Steel 0%
Global Metal AM Equipment Installation

Metal AM has been growing rapidly over last 5-6 years.

Selected Metal AM Machine (installation basis)

- It only took 2-3 years to double the size once the installation number hits 1,000 units

by selected Manufacturer 2017

- GE Additive – ARCAM + Concept Laser
- 3D Systems – Layerwise + Phenix
- Realizer – 50.1% owned by DMG Mori AG
- Others – Ex One, Sisma, Optomec, Voxeljet, Sodick, DMG Mori, Matsuura, Insstek, Bright Laser Tech., Sentrol, BeAM, Additive Industries, etc.
Market Approach ‘Think differently’

**DFAM – Design For Additive Manufacturing**

**Hydraulic Manifold**

**FROM THIS**

Traditional manufacturing

**TO THIS**

Metal 3D printing

-75% weight

1/2 size dimension

- Parts -80%
- No welds (more hygienic)
- Complex shape (double curved surface)
- Optimal configuration air holes, possible to make sure dough floats on product

**Heat exchanger**

**FROM THIS**

10.8 Kg

Traditional manufacturing

**TO THIS**

1.5 Kg

Metal 3D printing

-85% weight

1/5 size dimension

- No filth
- All desired shapes possible
- Better cut

source Aidro

source K3D Kaak Group
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Purchasing Manager Index - Where do we stand in the business cycle?

China stable ..... Rest of the World got a ‘reality call’

Index of 50 = ‘Break Even Point’*

* below 50 the industry contracts / above 50 it is expected to expand
The Aerospace ‘Roller Coaster’

Boeing & Airbus deliveries 2018 => +8% vs. record 2017. Total build ~5,500 in 2018. Air Transport 60%.

Enormous Order Backlog: >14,000 planes
Annual Roll-Out Increase: now over 1,600 units
=> Industry is busy for the next 8-10 Years
Market Outlook & Trends - The number of Oil rigs are still down!

*The graph speaks for itself, where there not too many out there? It is stagnating/slightly increasing for 1 year now.*
Open-die Forging Book 2018

Over 230 profiles of Open-die forging producers

Table of Contents

- Forging Market Data Chapter
  - Supply & Demand (historic and 2017 by Region, Steel Type, Product Form
  - Enduse breakdown (Oil & Gas, Energy, Heavy Industry, Tool & Die, etc.)
  - Outlook 2017 to 2020 (by Region, Steel Type and Industry)

- Company Profiles
  - Company Data (ownership, number employees, contact details, etc.)
  - Main Equipment (melting, casting, forging, - size, number, capacity)
  - Product Form, Grades and Dimensions (size, weight, steel types)
  - Estimated Production Volume 2017 (crude steel and forging output)
  - Special Remark (company specific highlight)

Benefits: You will save time, money and stay updated!
All the information you need is in this directory.

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What can SMR Premium offer to you?

Market Research
Boutique Consultancy
Data collection from the Market
Comprehensive Database & Experience
No too small, no too big, no too complicated

We
unlock

Market Analysis
Supply & Demand
End-use focused & Outlook
Competitor Analysis
Production cost models….

Commercial Excellence
Maximize overall Profitability
Portfolio Analysis
New Market Segments & Value add
Investments, Cooperation’s, Partnerships

Seminars & Conferences
Customized seminars
On-site seminars
3 annual global conferences
Top class speakers & attendees

your
potentials!
Thank you for your attention!

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